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Evaluation of fetal maturity by amnioscopy

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Curriculum vitae

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Since 1974, he has been working with Professor SALING *in Berlin on a sholarship from the Health Senator of Berlin.*

One of the most important preventive measures in obstetrics is the termination of pregnancy at the right time. It is difficult to define some important features of fetal maturity in high-risk infants because of the preventive early termination of pregnancy. Laboratory procedures [3] by which the fetal maturity is evaluated determine the functional maturity of separate organs, or they are able to estimate the completed development of the fetus. By combining several methods [7] one can approach very closely to the real maturity, while any single method shows considerable errors.

During routine amnioscopies **milky amniotic fluid has frequently been observed immediately before the spontaneous delivery of mature infants.** A striking fact was that **the delivery began spontaneously with the appearance of milky amniotic fluid** although the cervix was not yet ripe. It has been observed further that although the cervix was ripe **the delivery did not begin spontaneously if the amniotic fluid was clear.**

In our hospital, nearly 2500 women have given birth in recent years. Approximately one half of these women have been followed with amnioscopy. Amnioscopy in the non-risk-group is usually started at term, but amnioscopy in the risk group is, of course, started earlier.

1 Material and methods

By amnioscopy [9] the quality of the amniotic fluid proper as well as the quantity of vernix caseosa are determined. The amniotic fluid proper is divided into 4 groups:

1. **Clear amniotic fluid** [9]: Amniotic fluid is water-like clear. No particles of vernix are observed.
2. **Clear to milky amniotic fluid:** Transparency of amniotic fluid is reduced in its wider layer and one can observe smaller particles of vernix.
3. **Milky to clear amniotic fluid:** In its wider layer the amniotic fluid is milky, but in its thinner layer it is still clear. Larger flocks of vernix can be observed.
4. **Milky amniotic fluid** [9]: The amniotic fluid is of pure milky color, consisting of large flocks of vernix. The presenting part of the fetus can be seen only by pressing the amnioscope against it.

Evaluation is subjective, but even the beginner can soon separate the clear amniotic fluid from the milky one. The same criteria are applied in evaluating amniotic fluid obtained by amniotomy. The vernix which is first observed, by amnioscopy, in smaller particles, and later on in slowly floating flocks, is separated from the fetal skin. **With the appearance of vernix in the amniotic fluid the quantity of vernix on the fetal skin is thus diminishing.**

Since 1955 the quantity of vernix on fetal skin has been determined immediately after the birth.

Referring to the quantity and location of vernix on the fetal skin, all newborns are classified into 4 groups:

1. **Vernix III:** The entire newborn is covered with vernix.
2. **Vernix II:** The newborn is still covered by vernix, but some areas of clear skin can be seen (especially on the chest).
3. **Vernix I:** The majority of the newborn's skin is without vernix, it can only be observed in creases.
4. **Vernix 0:** There is no vernix on the newborn's skin.

The following questions needs to be answered:

1. What is the relation between the duration of gestation from menstrual data and the quantity of vernix on the newborn's skin?
2. What is the temporal correlation between the spontaneous delivery of a mature infant and the amnioscopic appearance of amniotic fluid?
3. What is the relation between the quantity of vernix on the newborn infant and the amnioscopically milky amniotic fluid, and what is the relation like if the amniotic fluid is clear?
4. What is the quantity of vernix on premature infants?

The amnioscopic investigations contained in this study were performed by the author.

2 Results

2.1 The relation between duration of gestation from menstrual data and the quantity of vernix on newborn's skin

1169 newborns 1960 were collected and they were then classified, according to duration of gestation from menstrual data, into 7 groups. Each group includes 6 days, only the group at term has 7 days. In each group, the quantity of vernix on the skin of the newborn is shown. The duration of gestation is divided, so that the extreme groups before and after term correspond approximately to the temporal definition of prematurity and postmaturity. Newborns whose vernix had not been estimated, or whose term was unknown, were excluded. The year 1960 was taken on purpose because no oxytocin was then used for induction of labor.

Fig. 1 shows the relation between the duration of gestation from menstrual data and the distribution of vernix on the newborns. **With increasing lenght of gestation more and more infants without vernix (Vernix 0) were born.** By contrast, by decreasing the duration of gestation more and more infants completely covered with vernix (vernix III) were born.

The groups of infants where vernix had begun to diminish already (Vernix I, Vernix II) in the middle of the columns, are nearly equally presented in all graphs. This has been proved also by statistical calculation with the χ^2 method. Before term, significantly more infants with Vernix III were born than after term ($P < 0.001$).

The number of infants born without vernix after term, is statistically significantly larger than the number of infants born before term ($P < 0.001$).

It is interesting to note that the groups of infants with Vernix I and II are equally represented before and after term, and there is no statistical significance.

2.2 Temporal correlation between the spontaneous delivery of a mature infant and the amnioscopic appearance of amniotic fluid

The group consists of 200 women in whom during amniscopy amniotic fluid was estimated, and where the delivery of a mature infant occurred spontaneously. 251 amnioscopic examinations were performed in these women. Amniotic fluids were divided, according to the definition mentioned above, into 4 groups. According to the time

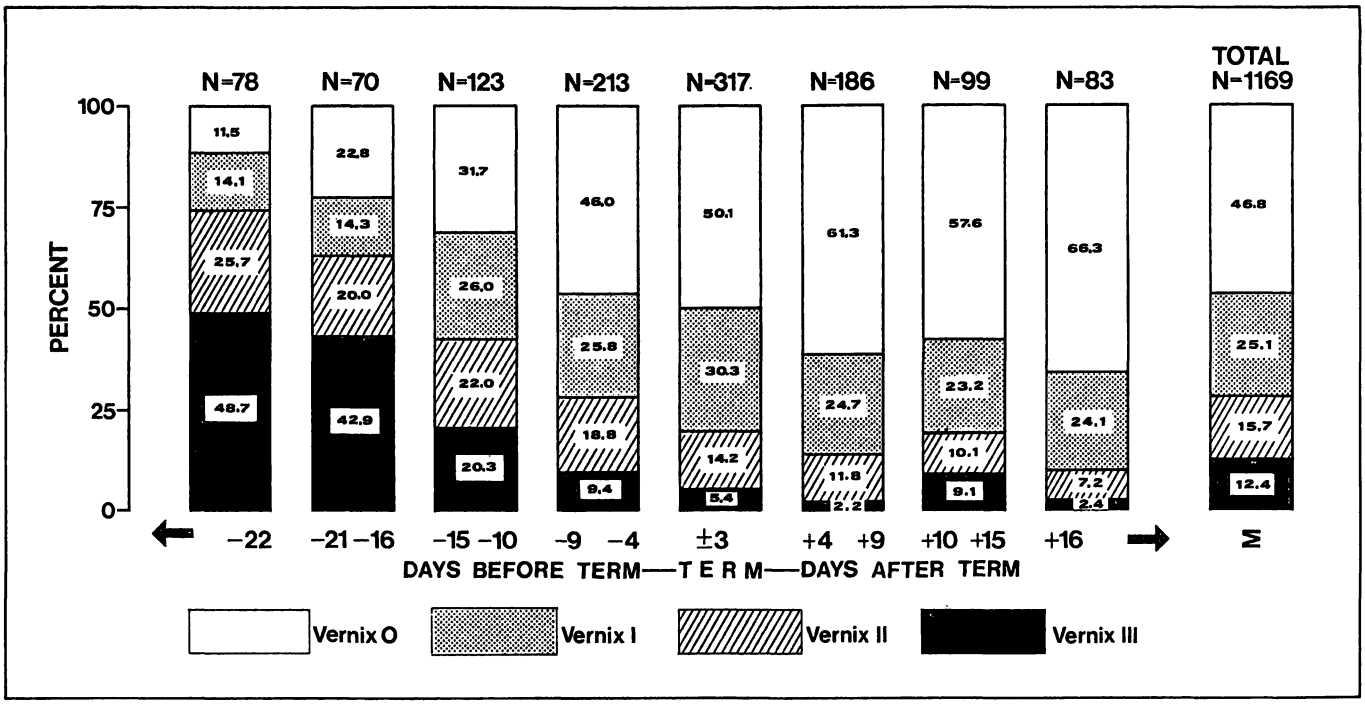

Fig. 1. Relation between the calculated term of delivery and the quantity of vernix on newborns in time intervals.

interval between amnioscopy and delivery, the women are divided into 3 groups:

0—4 days

5—8 days

9 and more days before spontaneous delivery (Tab. I).

Tab. I. Amnioscopic outlook at different time intervals before spontaneous birth of mature fetus.

Number of pregnant women: 200
Number of amnioscopic examinations: 251

Amnioscopic outlook	Days before spontaneous delivery 0—4	5—8	9 and more
Milky	124	4	0
Milky to clear	21	6	0
Clear to milky	25	9	0
Clear	17	19	26
Total in intervals	187	38	26

At the beginning of spontaneous delivery or during the time up to 4 days before delivery, 17 cases out of 187, who were observed, showed clear amniotic fluid without vernix (9.1%), 124 cases (66.3%) showed milky amniotic fluid rich in vernix, and the rest of the cases showed milky nuances. In the group of 5 to 8 days before spontaneous delivery (38 amnioscopic examinations), half showed clear amniotic fluid, and the other half showed milky fluid and its nuances. Amnioscopic examinations performed in the group of 9 and more days before spontaneous delivery (26 amnioscopic examinations) showed clear amniotic fluid in all cases.

2.3 Quantity of vernix on the newborn with amnioscopically clear and milky amniotic fluid

200 women have been examined where, in the period from 0 to 4 days before delivery, the amniotic fluid was milky with vernix, and 100 women where, during the period of 0 to 4 days before delivery, clear and clear to milky amniotic fluid was observed. (Clear — without vernix = 47 cases, clear to milky = 53 cases). Both groups contain spontaneous and operative deliveries. In both groups also the quantity of vernix was estimated (Fig. 2).

With **amnioscopically clear amniotic fluid** (100 cases), 51 cases of newborns showed Vernix III, 43 showed Vernices I and II, and 6 cases showing Vernix 0. Out of these 6 cases,

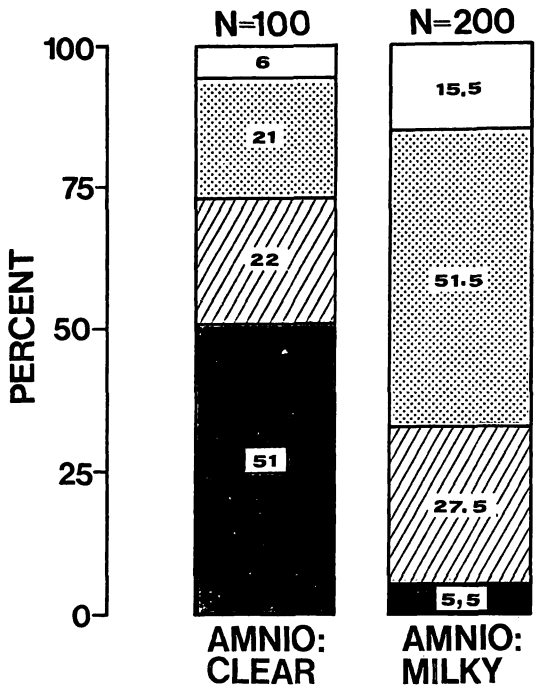

Fig. 2. Relation between amniotic fluid appearance during the last 4 days before delivery and the quantity of vernix on newborns.

the amniotic fluid was in 5 cases clear to milky 1 to 2 days before delivery, and only one case showed clear amniotic fluid without vernix on the day of delivery.

With **milky amniotic fluid,** 11 cases out of 200 showed Vernix III after delivery (5.5%). In all other cases (94.5%), the quantity of vernix on the newborn was diminished.

With amnioscopically clear amniotic fluid, significantly more newborns were completely covered with vernix (Vernix III) than with the milky one ($P < 0{,}001$).

The number of newborns whose vernix has started to diminish already (Vernices I and II) is significantly bigger with milky amniotic fluid than with the clear one ($P < 0.001$). Similarly, the number of newborns whose vernix has already disappeared is significantly greater with milky amniotic fluid ($P < 0.005$).

2.4 Quantity of vernix on premature infants

The quantity of vernix after delivery has been estimated in 110 premature infants. Here the duration of gestation less than 37 weeks and prematurity have been considered. 10 women out of these have delivered twins (10%), and in 9 cases both infants were completely covered with vernix (Vernix III), which are considered as 9 cases of Vernix III. In one case one of the infants showed Vernix III, and the other infant showed Vernix II. This pair of infants has been considered as 1 case of Vernix II. The premature infants showed 84 cases of Vernix III, 10 cases of Vernix II, 4 cases of Vernix I, and only 2 cases of Vernix 0 (Fig. 3).

3 Discussion and conclusions

In a textbook of obstetrics from 1862 [5], we can find the following description of the amniotic fluid quality: "At first it is clear, but later on it becomes turbid and flocculent." The same textbook gives also the description of the changing quantity and distribution of vernix on the newborn.

A 1925 description and explanation of amniotic fluid color is the following: "In early months, it is clear, watery, yellowish. Later on it is turbid and whitish owing to admixtures of cells, vernix and hair. The turbidity is the consequence of admixtures which can be removed by filtration" [4].

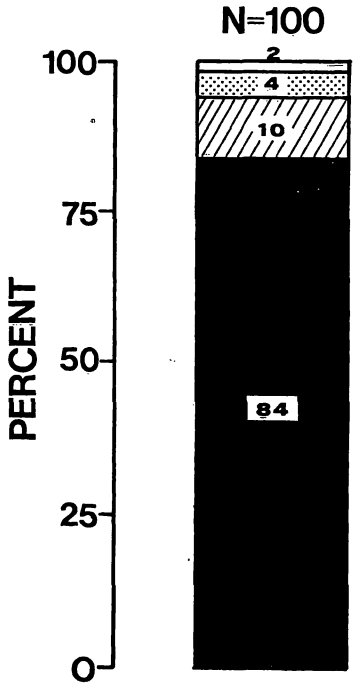

Fig. 3. Vernix quantity on prematures after delivery.

Our observations have proved a **correlation between the spontaneous delivery of a mature infant, and the appearance of amnioscopically milky amniotic fluid.** The nuances of milky amniotic fluid begin to be observed approximately 7 days before spontaneous delivery. However, before this period, the amniotic fluid is clear. By observations in intervals one can easily follow the changing of nuances and the appearance of milky amniotic fluid. Subjective observation of milky amniotic fluid by amnioscopy is reliable. However, it is more difficult to evaluate the nuances, and therefore the reproducibility of their evaluation is less accurate.

The relation between the appearance of amnioscopically milky amniotic fluid and diminution of vernix quantity in the newborn has been proved. In other words, the flaking off of vernix from the fetal skin [10] results in the appearance of milky amniotic fluid, and both these phenomena are considered to be a sign of fetal maturity.

Clinical evaluation of vernix quantity in the newborn immediately after birth is the most simple method for fetal maturity estimation. **Vernix III** indicates that the fetus did well before delivery, and that further duration of gestation would be useful. If an infant with Vernix III is born when amnioscopically particles of vernix have been observed, i. e. transition of Vernix III to **Vernix II**, the newborn will be mature. If this condition is not fulfilled, it is more likely that this newborn will have troubles with adaptation during the perinatal period.

In 84% of prematures Vernix III was observed. Bishop [2] has stated that the incidence of prematurity was 80—90%, if the fat cell count was less than 2%. Appearance of fetal epidermis cells as well as the flaking of vernix caseosa into the amniotic fluid occur at the same time [6]. As long as the fetus is entirely covered by vernix, skin cell debris cannot slough off.

The absence of vernix on the fetal skin in postmaturity has been known for a long time [8]. The distribution of vernix on fetal skin according to gestational age (Fig. 1), gives us an explanation of well-known facts: That all "postmature" newborns do not exhibit postmaturity signs, and that these signs can be found also in term or preterm infants.

The infants without vernix **(Vernix 0)** are born at still sufficient placental function, but they can also be born with initial or even severe placental insufficiency, depending on the time spent in utero without vernix. All these infants are mature, but there are also postmature infants manifesting sequelae of placental insufficiency or dysfunction. **Vernix I and II are treated together as a sign of maturity.** Dynamics of changes in amniotic fluid and vernix changes on the fetus are shown in Fig. 4.

Evaluation of vernix on fetal skin is important, besides the estimation of neonatal maturity, namely it helps: Control excessive or insufficient obstetric actions. Every woman has her calculated term (or unknown), the term at which she delivers, and the term which would be most favourable for the infant to be born. **The estimation of milky (mature) amniotic fluid with amnios-**

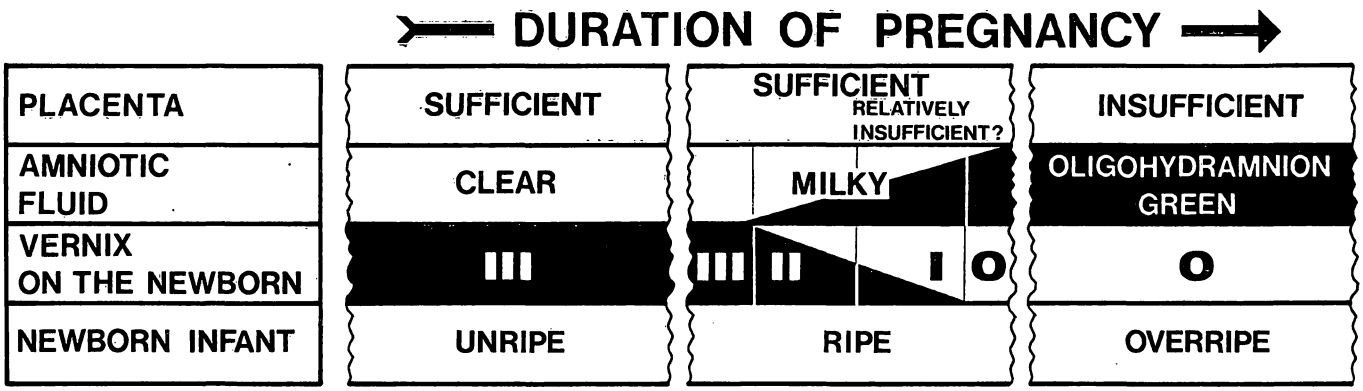

Fig. 4. Temporal changes of vernix quantity and amniotic fluid quality during pregnancy.

copy, is the most simple and non-invasive method for the determination of this term. We have used this method for 3 years now. During the last 18 months, delivery by induction has been performed in 250 women (6.8% of all deliveries), where milky amniotic fluid was the only indication for termination of pregnancy. We were carrying out these induction deliveries within a period of 46 days (from 26 days before till 20 days after calculated term). No infant was, according to the physical appearance and neurological indications, reported premature or postmature (modified estimation according to FARR [1]). Neither of these infants showed any adaptation disturbances during the perinatal period. It has thus been confirmed that **induction should be started when milky (mature) amniotic fluid appears if delivery does not start spontaneously within some days.**

One of the further tasks we have to investigate is the objective measurement of vernix quantity and the milkiness of amniotic fluid as well as the comparison with other presently known methods for fetal maturity estimation.

Summary

One of the most important preventive measures in obstetrics is the individual evaluation of the most appropriate time to terminate a pregnancy.

The value of amnioscopy used as the method for evaluation of fetal maturity has been ascertained.

It has been observed that **the delivery of a mature newborn in most cases starts spontaneously at the moment we recognize milky amniotic fluid by amnioscopy.** These infants possess mostly a reduced quantity of vernix on the skin and do not manifest any adaptation disturbances in the perinatal period.

By amnioscopy [9] the quality of the pure amniotic fluid as well as the quantity of vernix caseosa are determined. The pure amniotic fluid is devided into 4 groups:

1. **Clear amniotic fluid** [9]: Amniotic fluid is water-like clear. No particles of vernix are observed.
2. **Clear to milky amniotic fluid:** Transparency of amniotic fluid is reduced in its wider layer and one can already observe smaller particles of vernix.
3. **Milky to clear amniotic fluid:** In its wider layer the amniotic fluid is milky, but in its thinner layer, it is still clear. Larger flocks of vernix can be observed.
4. **Milky amniotic fluid** [9]: The amniotic fluid is of pure milky color consisting of large flocks of vernix. The presenting part of fetus can be seen clearly only by pressing the amnioscope to it.

The same criteria are applied in the evaluation of amniotic fluid by amniotomy.

The quantity and location of vernix on fetal skin are determined immediately after the birth. Referring to this **the newborns are classified into 4 groups:**

1. **Vernix III:** The entire newborn is covered with vernix.
2. **Vernix II:** The newborn is still uniformly covered with vernix, but some areas of clear skin can be seen (especially at the chest).
3. **Vernix I:** The majority of the newborn's skin is without vernix, it can only be observed in creases.
4. **Vernix O:** There is no vernix on the newborn's skin.

Our studies have confirmed the well-known observation that **with increasing gestational age the quantity of vernix on the fetal skin is diminishing (Fig. 1) indicating the increased chance for postmaturity.** After term, significantly more infants are born without vernix (Vernix 0) than before term ($P < 0.001$), and significantly less infants were entirely covered with vernix ($P < 0.001$). 200 women were examined by amnioscopy during the last days before spontaneous delivery of a mature infant. Milky amniotic fluid with nuances was observed in 91% during the last four days before delivery, while 9 and more days before delivery clear amniotic fluid was always found **(Tab. I).**

A distinct relation exists between the appearance of milky amniotic fluid at amnioscopy, and the diminishing quantity of vernix on the fetus after delivery (Fig. 2). Of 200 women in whom milky amniotic fluid was observed by amnioscopy during 0 to 4 days before delivery, only 5.5% of the infants were entirely covered with vernix (Vernix III), while in all other cases the amount of vernix was decreased. Of 100 women in whom clear amniotic fluid was observed 0 to 4 days before delivery, Vernix III was observed after delivery in 51% of cases. The difference is statistically significant ($P < 0.001$). In prematures, Vernix III was observed after the birth in 84% of cases **(Fig. 3).**

Dynamics of changes in amniotic fluid and vernix changes on the fetus is shown in **Fig. 4: Approximately one week before delivery of a mature infant, the vernix begins to flake off the skin and the consequence is the appearance of milky amniotic fluid with particles of vernix.** The milky amniotic fluid at amnioscopy was the only indication for 250 inductions which were performed within 46 days (from 26 days before till 20 days after the calculated term). All infants were mature and had no trouble in the perinatal period. **The appearance of milky (mature) amniotic fluid indicates the maturity of the fetus** and gives an indication for the termination of the pregnancy if delivery does not occur spontaneously within a few days.

Estimation of vernix on the fetus at delivery is presently the most simple method for the evaluation of infant maturity. The newborns partly covered with vernix (Vernix I and II) are mature and do not show any adaptation disturbances after delivery.

The infants, born without vernix (Vernix 0) are also mature, but here some cases of postmaturity can be found. Some infants who are entirely covered with vernix (Vernix III) at delivery have some adaptation disturbances during the perinatal period.

Keywords: Amnioscopy, amniotic fluid, estimation of fetal maturity, fetus, induction of labor, vernix caseosa.

Zusammenfassung

Bestimmung der fetalen Reife durch Amnioskopie

Eine der wichtigsten Vorsorgemaßnahmen in der Geburtshilfe ist die individuelle Bestimmung des günstigsten Zeitpunktes zur Beendigung der Schwangerschaft.

Der methodische Wert der Amnioskopie zur fetalen Reifebestimmung wurde gesichert.

Es wurde beobachtet, daß **die Geburt eines reifen Feten in der Mehrzahl der Fälle in dem Moment spontan einsetzt, in dem man bei der Amnioskopie milchiges Fruchtwasser beobachtet.** Diese Kinder haben meistens eine verringerte Menge von Vernix auf der Haut und zeigen keinerlei Adaptationsstörungen in der Perinatalperiode. Die Qualität des reinen Fruchtwassers und auch die Menge der Vernix caseosa wurden amnioskopisch [9] bestimmt. Die Beurteilungen des reinen Fruchtwassers wurden in 4 Gruppen unterteilt:

1. **Klares Fruchtwasser** [9]: Das Fruchtwasser ist klar wie Wasser. Es können keinerlei Vernixteilchen beobachtet werden.
2. **Klar bis milchiges Fruchtwasser:** Die Transparenz des Fruchtwassers in einer dickeren Schicht ist herabgesetzt und man kann schon kleine Vernixpartikel beobachten.
3. **Milchig bis klares Fruchtwasser:** In einer dickeren Schicht erscheint das Fruchtwasser bereits milchig, aber in einer dünnen Schicht ist es noch klar. Große Vernixflocken können bereits wahrgenommen werden.
4. **Milchiges Fruchtwasser** [9]: Die Amnionflüssigkeit ist von rein milchiger Farbe und besteht aus großen Vernixflocken. Der vorangehende Teil des Fetus kann nur durch direktes Heranführen des Amnioskopes erkannt werden.

Dieselben Beurteilungskriterien wurden auch den durch Amniotomie gewonnenen Fruchtwasserproben zugrunde gelegt.

Menge und Lokalisation der Vernix auf der Haut des Neugeborenen wurden unmittelbar nach der Geburt bestimmt. **Die Neugeborenen wurden diesbezüglich in ebenfalls 4 Gruppen unterteilt:**

1. **Vernix III:** Das Neugeborene ist völlig bedeckt mit Vernix caseosa.
2. **Vernix II:** Das Neugeborene ist immer noch einheitlich mit Vernix bedeckt, aber es gibt schon Hautpartien ohne Käseschmiere (besonders an der Brust).
3. **Vernix I:** Der Hauptanteil der Haut des Neugeborenen weist keine Vernix caseosa auf, lediglich in den Hautfalten finden sich noch Reste.
4. **Vernix 0:** Die Haut des Neugeborenen ist an keiner Stelle von Käseschmiere bedeckt.

Unsere Untersuchungen haben die bekannte Beobachtung bestätigt, daß sich **die Menge an Käseschmiere auf der Haut des Fetus mit zunehmender Gestationsdauer verringert (Fig. 1) und damit das zunehmende Risiko der Postmaturität anzeigt.** Nach dem Tragzeitende werden signifikant mehr Kinder ohne Vernix caseosa (Vernix 0) geboren als vor dem Termin ($p < 0{,}001$) und es waren signifikant weniger Neugeborene völlig mit Vernix bedeckt ($p < 0{,}001$).

200 Frauen wurden während der letzten Tage der Schwangerschaft vor der spontanen Geburt eines reifen Kindes durch Amnioskopie kontrolliert. Die mit Nuancen milchige Farbe der Amnionflüssigkeit wurde in 91% während der letzten 4 Tage vor der Geburt beobachtet, während 9 und mehr Tage davor immer klares Fruchtwasser angetroffen wurde **(Tab. I).**

Es gibt eine klar erkennbare **Relation zwischen dem Auftreten von milchigfarbenem Fruchtwasser bei der Amnioskopie und der Verringerung der Käseschmiere beim Kind nach der Geburt (Fig. 2).** Bei 200 Schwangeren, bei denen amnioskopisch milchiges Fruchtwasser während 0—4 Tagen vor der Geburt festgestellt worden war, waren nur 5,5% der Kinder völlig mit Käseschmiere bedeckt (Vernix III), während in allen anderen Fällen die Menge der Käseschmiere herabgesetzt war. Bei 100 Frauen mit klarem Fruchtwasser 0—4 Tage vor der Geburt, wurde die Vernixgruppe III in 51% der Fälle nach der Geburt beobachtet. Diese Differenz ist statistisch signifikant ($p < 0{,}001$).

Bei Frühgeborenen wurde die Vernixgruppe III in 84% der Fälle nach der Geburt beobachtet **(Fig. 3).**

Die Dynamik der Veränderungen der Amnionflüssigkeit und der Käseschmiere auf der kindlichen Haut sind in **Fig. 4** wiedergegeben: **ungefähr 1 Woche vor der Geburt eines reifen Kindes beginnt das Abschilfern der Vernix von der Haut. Die Folge davon ist das Auftreten von milchigem Fruchtwasser mit Vernixpartikeln.** Das Symptom milchiges Fruchtwasser bei der Amnioskopie war die einzige Indikation für 250 Geburtseinleitungen in einem Zeitraum von 46 Tagen um den Geburtstermin herum (von 26 Tagen vor bis 20 Tagen nach dem errechneten Termin). Alle Kinder waren reif und hatten keinerlei Schwierigkeiten in der Perinatalperiode. **Das Auftreten von milchigem (reifem) Fruchtwasser ist ein Zeichen für die Reife des Fetus und ist eine Indikation für die**

Schwangerschaftsbeendigung in jenen Fällen, in denen die Wehen nicht spontan nach einigen Tagen einsetzen.
Die Bestimmung der Käseschmiere auf der Haut des Neugeborenen bei der Geburt ist momentan die einfachste Methode der Bestimmung der fetalen Reife. Neugeborene, die teilweise mit Käseschmiere bedeckt sind (Vernixgruppe I und II), sind reif und haben keine Adaptationsschwierigkeiten nach der Geburt. Kinder, die ohne Käseschmiere zur Welt kamen (Gruppe 0), sind ebenfalls reif, aber in dieser Gruppe finden sich einige Fälle von Postmaturität. Einige Babys, die bei der Geburt völlig mit Käseschmiere bedeckt waren (Vernixgruppe III), haben gewisse Anpassungsstörungen während der Perinatalperiode.

Schlüsselwörter: Amnioskopie, Bestimmung der fetalen Reife, Fetus, Fruchtwasser, Geburtseinleitung, Vernix caseosa.

Résumé

Evaluation de la maturité foetale par amnioscopie
Une des mesures préventives les plus importantes en obstétrique est l'évaluation individuelle du moment le plus adéquat pour terminer la grossesse.
La valeur de l'amnioscopie utilisée comme méthode d'évaluation de la maturité foetale a été bien établie.
Nous avons observé que l'accouchement d'un enfant à terme démarre spontanément dans la majorité des cas au moment où nous constatons un liquide amniotique d'aspect laiteux à l'amnioscopie. La plupart du temps ces enfants sont recouverts d'un faible quantité de vernix et ne manifestent aucun trouble d'adaptation au cours de la période péri-natale.
Par amnioscopie [9] la qualité du liquide amniotique ainsi que la quantité de vernix caséosa sont déterminés. Les aspects du liquide amniotique peuvent se diviser en 4 groupes:

1. **Liquide amniotique clair** [9]: le liquide amniotique est clair comme de l'eau. Il n'y a pas de particules de vernix dans ce liquide.
2. **Liquide amniotique de clair à laiteux:** en couche épaisse la transparence du liquide amniotique est réduite et on peut déjà observer de petites particules de vernix.
3. **Liquide amniotique de laiteux à clair:** en couche épaisse le liquide amniotique est déjà laiteux, mais en couche mince il est encore clair. De gros flocons de vernix peuvent déjà être observés.
4. **Liquide amniotique laiteux** [9]: le liquide amniotique présente une coloration laiteuse due à la présence de très gros flocons de vernix. La présentation foetale ne peut être vue de façon claire que lorsqu'on applique l'amnioscope sur celle-ci.

Les mêmes critères peuvent être appliqués à l'évaluation du liquide amniotique recueilli par amniocentèse.
La quantité et la situation du vernix sur la peau du foetus sont déterminés immédiatement après la naissance. Par ce procédé **on peut classifier les nouveaux-nés en quatre groupes:**

1. **Vernix III:** Le nouveau-né est entièrement couvert de vernix.
2. **Vernix II:** Le nouveau-né est encore couvert de façon à peu près uniforme de vernix mais certains endroits en particulier au niveau de la poitrine laissent déjà apparaitre la peau.
3. **Vernix I:** La plus grande surface corporelle du nouveau-né n'est pas recouverte de vernix, on ne peut retrouver celui-ci qu'au niveau des plis de flexions.
4. **Vernix 0:** Il n'y a pas de vernix sur le nouveau-né.

Nos études ont confirmé la notion bien établie que lorsque on se rapproche du terme **la quantité de vernix recouvrant la peau du foetus diminue (Fig. 1) ce qui indique une augmentation de la probabilité de post-maturité.** Après le terme, il y a de façon significative plus d'enfants qui naissent sans vernix (Vernix 0) qu'avant terme ($P < 0{,}001$), et à l'inverse il y a significativement moins d'enfants qui naissent entièrement couverts de vernix ($P < 0{,}001$).
200 femmes furent examinées par amniocopie au cours des derniers jours précédant l'accouchement d'un enfant à terme. Le liquide amniotique laiteux fut observé dans 91% des cas qui se trouvaient dans les quatre jours précédant l'accouchement. A l'inverse lorsque l'on était à au moins 9 jours du terme on a toujours trouvé un liquide amniotique clair **(Tab. I).**
Il existe une relation certaine entre l'apparence du liquide amniotique laiteux à l'amnioscopie et la diminution quantitative de vernix recouvrant le foetus au moment de l'accouchement (Fig. 2). Les 200 femmes dont le liquide amniotique avait un aspect laiteux à l'amnioscopie durant les quatre derniers jours précédant l'accouchement, seulement 5,5% accouchèrent d'enfant entièrement recouvert de vernix (Vernix III). Dans tous les autres cas la quantité de vernix était diminuée. Parmi les 100 femmes dont le liquide amniotique fut considéré comme clair au cours des quatre derniers jours précédant l'accouchement le type Vernix III fut observé après l'accouchement dans 51% des cas. La différence est statistiquement significative ($P < 0{,}001$). En cas de prématurité, le type vernix III fut observé dans 84% des cas **(Fig. 3).**
Les modifications du liquide amniotique et du vernix sont montrées dans la **Fig. 4: une semaine avant l'accouchement, le vernix commence à se décoller de la peau du foetus ce qui provoque l'aspect laiteux du liquide et l'apparition de particules de vernix au sein de celui-ci.** L'aspect laiteux du liquide amniotique a été la seule indication de 250 déclenchements qui ont été réalisés au cours d'une période de 46 jours autour du terme. Tous les enfants étaient matures et ne présentèrent aucun trouble au cours de la pèriode péri-natale. **L'aspect laiteux du liquide**

amniotique indique la maturité foetale et donne l'indication de l'interruption de la grossesse dans les cas où un accouchement spontané ne survient pas rapidement. L'évaluation de la quantité de vernix recouvrant le foetus au moment de l'accouchement est à l'heure actuelle la méthode la plus simple pour évaluer la maturité de l'enfant. Les nouveauxnés partiellement couverts de vernix (Vernix I et II) sont mures et ne montrent pas de troubles de l'adaptation après l'accouchement. Les enfants nés sans vernix (Vernix 0) sont également mures, mais dans certains cas ils peuvent être post-matures. Plusieurs qui étaient entièrement couverts de vernix (Vernix III) ont présenté des troubles de l'adaptation au moment de la période périnatale.

Mots clés: Amnioscopie, déclenchement du travail, évaluation de la maturité foetale, foetus, liquide amniotique, vernix caséosa.

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